AGS/RHIC
Radiation
Safety
Committee

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Minutes of Sub-Commitee review of February 3, 2000

Single Bunch Test to AGS Switchyard

Present: L. Ahrens, K. Brown, J.W. Glenn, A. Pendzick and D. Beavis

Motivation: A test to extract single bunches of beam to the AGS floor is proposed to prepare for future experiments. K. Brown provided a description of the test and proposed check-off list items (see attachment 1). The experiment will typically operate with one bunch accelerated and extracted with a frequency of about 1 per minute. The experiment may take more cycles if g-2 is not operating. It is expected that the testing will extend over a period of 1 week.

The committee approved the request.

This recommendation was based on the following:

The maximum beam intensity will be 1TP/s and limited administratively. **(CK-1-00-SEB)**

The RCT is to be notified before a test period begins. **(CK-2-00-SEB)**
The RCTs will use the HPI-1030 which has better response for pulsed beams then the HPI-1010. The dose rates from the pulsed beam will not be high enough to cause a reduced sensitivity in the chipmunks.

This will be the first extracted proton beam with the building posted as a controlled area rather than a radiation area. The alarm level and interlock level of the chipmunks has been previously set with the building being classified as a radiation area. Based on the expected losses in the switchyard there may be levels about 5 mrem/hr near some of the trenches. A section starting at the tunnel and extending past the switchyard gate will be posted as a radiation area. This zone should be about 10 feet from the wall. **(CK-3-00-SEB)**

The 2 chipmunks past the gate will have their alarm levels set to 4mrem//hr. **(CK-4-00-SEB)**

The locations of the chipmunks along the east switchyard wall will be verified before the initial test.
(CK-5-00-SEB)

The beam will be lost in the switchyard. The amount of beam lost for the test will be much less than normal SEB operations. No potential damage to transport elements is expected.

This test is not expected to cause unusual radiation conditions for the AGS ring or the FEB program.

It is requested that the Liaison Physicist review the chipmunk levels in building 912 which are sensitive to proton losses in the AGS ring and consider whether area postings need to be modified or the alarm level adjusted on the chipmunks. After the meeting the chipmunk at the north gate to the AGS ring had the alarm level reduced to 4 mrem/hr. **(ACT-6-00-SEB/AGS)**

A discussion with respect to North Gate Chipmunk (AGS) resulted in having the area near the chipmunk reposted as Radiation Area. In addition, a power supply building located north of this chipmunk, on part of the AGS berm, will be monitored by RCT for any unusual levels.

Attachment in file

This is the study plan, which describes what I will do. The first part of the study is done, the second part entails actually extracting the beam.

I don't need to bring the beam all the way to the A target area. It is all a matter of what's the best place to dump the beam. Since the intensity will be only around 1 TP (not more than 1.5 TP), Dumping the beam into the iron of AD2 and AD3 is then ok. Dumping the beam into the backleg iron of AD4 and AD5 is also ok. [Al P. concurs]

It should be noted that the study still operates under a pulse stealing mode. So beam will not be continuously going into switchyard, but only when we request shots.

Clarification. Mode of running will be 1 bunch acceleration, and 1 bunch extracted, with about 1 TP in that bunch. Intensity will be limited administratively. When I or JWG are not present the normal lock out of SEB will be done.

For a check off list here is a my proposal.

1. current checklist acts to establish initial state. All chipmunks are active. Switchyard, A target cave, and B target caves are locked up. All 4 lines are locked out by LP's. Shielding integrity already checked.

2. Currently the ramp going down to bldg 912 is posted as controlled area. I will have HP change the posting to radiation area, between the area where the ramp goes down from MCR, to the switchyard east gate.

3. The shield tops over the AGS are locked per procedure. I will also have the shield tops over the B/C split areas locked up (cross over will be posted as radiation area, but access allowed). [Al, can we make sure the procedure is in place for those shield tops ?]

4. I don't see any need to change any chipmunk settings. We are well below the region where recombination takes place in the ion chambers, according to the Fermi lab Report TM-1512.

5. Given the above I will allow the tags to be removed from the F10, CD1, and CQ1-4. The check list will include a section for re-applying the tags when the study is not taking place.

K. Brown

Here is the plan for studying fast extracted beam to switchyard. There are two major parts. The first part is done without extraction to switchyard, just looking at G10 kicked beam in the AGS. The second part consists of getting a check off list taken care of and transporting beam (low intensity ~ 1 tp with 1 bunch) to at least cf100. I would hope for a beam line to dump into, but I don't know if I will get it (A is preferred). The first part hopefully can be done next week. I would wait until the last week of January or the first week in February to do the second part, if possible. Both parts can be done in a pulse stealing mode. Initial setup may take a few hours, depending on how well we get user 2 to match user 1, and how difficult it may be to not effect G-2 on the following cycle. It is all done by pulse stealing, though.

Basic Setup:

Work on ALL user 2, stealing cycles.
1. Nominally the same as G-2, except;
1.1 no H10 bump (pulse power supply group will say how)
1.2 1 bunch with 1-2 tp to get 1 bunch we put beam only on the first Booster cycle (no. 2), and adjust
ARF.PHBACK_PH_TRIM to change h=6-12 phase.
1.3 1 FEB Request.
1.4 tunes and G10 kicker will be varied.
2 The FPBLW will be powered to give an orbit deformation at F5 .
3. We will need tunes (horizontal), orbits, and beam loss instrumentation. Also would be useful to have frequencies. All this should be already available.
Available fast pues for looking at the kicked beam are F20 and A18 (any more ??)
Some IPM measurements would be useful, to get an estimate on emittance.
4. I will have the F10 flag, CF011, and CF100. The F5 flag is not available.
5. There is a new C10 SEC in place.
1. Studies of Kicked beam, no extraction.
1.1 Beam position on fast pues of kicked beam vs horizontal tune and vs kicker amplitude. Models show the phase at f5 may be sensitive to tune. This is to determine how sensitive and how good an agreement there is with models.
1.2 Beam losses around AGS vs kick amplitude. To step over the F5 septum we need a 1.5 to 2 mrad kick, depending on beam emittance. Betatron oscillations can be significant at 2 mrad, so we should determine if beam losses show up and where.
1.3 Beam losses and orbits with F10 bump on. Assuming we get past these with success, then we go into the second set of studies.
2. Studies of extraction losses and beam emittance parameters.
2.1 Losses on F5/F10 versus kick amplitude and tune. Having the data from 1., we can fine tune things and look for 0 % beam loss on F5.
2.2 Calibrate the efficiency for fast extraction. (normal procedure with F5). (e.g., create a loss on F5 septum by distorting the bump or skewing the septum physically and measure extracted beam intenstiy versus extraction losses- all normalized on internal cbm).
2.3 Measure beam emittance parameters using cf100. This is needed to make sure the parameters assumed by the models are realistic.

Analysis:
1. from 1.1 we will compare change in position on pues vs kicker amplitude and vs tune to the models. Differentially things should match. Hopefully we can get good absolute calibrations.
2. from 1.2 we can compare loss points to predicted loss points. No real analysis here.
3. from 2.1 we may be able to determine an emittance at F5, based on the profile accross the septum. This is redundant to other measurements.
4. from 2.2 plot eff. vs ineff. calibration of loss monitor and sec, compare to normal seb values.
5. from 2.3 plot CQ1&2 strengths vs beam size at CF100, extract emittance and twiss parameters to fitted parabola (we know these quads very well, so the matrices are well defined).

K. Brown